PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in and relating to Centerless Grinders

We, ZKL-VYZKUMNY USTAV PRO VALIVA LOZISKA V BRNE, a Czechoslovakian Company, of postovni urad Brno 32, Brno, Czechoslovakia, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

During the grinding by throughfeed method with centreless grinding machines diminution of the grinding wheel diameter occurs due to wear, which results in the increase of the workpiece diameter if the adjustment of cut remains invariable. This increase of the workpiece diameter must be kept within the limits of the manufacturing tolerance. When producing cylindrical workpieces, it is possible to introduce into the automatic cycle of the machine the measuring operation as well, in order to produce an impulse to provide an incremental in-feed of the grinding wheel.

Several methods for such measuring which are applicable for grinding of bearing rings, rollers and needles are known but no device is known as yet, that could be employed in a similar manner for the grinding of conical surfaces, especially for grinding conical surfaces of tapered rollers for antifriction roller bearings.

Methods that are suitable for measuring the diameter of cylindrical bodies are not applicable in this case and with regard to the comparatively wide manufacturing tolerance of the fillet radius and to the position of the edge on the largest diameter and to the possibility of irregularities on the edge of the conical surface, measuring the maximum diameter of the tapered rollers would hardly be satisfactory.

The present technical standard also corresponds with these assumptions: the operation measurement of the tapered roller diameters is effected upon the whole after they have been taken out of the automatic cycle. Thus, for example, a method is known, in which such taking out is automatically effected by a special arm, whose movement is synchronised with the revolutions of the regulating wheel. This device is, however, comparatively complicated and is not suitable to be used for grinding in case of two connected machines.

The object of this invention is to provide an additional device for centreless grinding machines and to provide an automatic adjustment of the grinding wheel to the cut during the throughfeed grinding of conical surfaces on tapered rollers for antifriction roller bearings. A feature of the invention is the introduction of operational measurement of the tapered roller diameters into the automatic cycle, without making it necessary to take out single tapered rollers. This measuring provides electrical signals, the evaluation of which involves an impulse for an automatic incremental in-feed of the grinding wheel. The device makes use of the fundamental parts of the centreless grinding machine and attains technical improvement through their simple adjustment.

The measurement of the tapered roller diameter is effected by means of a measuring contact of an electro-contact head. During the measuring operation the tapered roller lies on a prismatic measuring work rest fixed closely between the rear face of the regulating wheel and the mouth of a discharge pipe for the tapered rollers, so that the tapered roller, which is displaced in axial direction by the carrier face of a helical groove of the regulating wheel along a supporting rail, is positively caused to pass from the groove over the measuring work rest into the mouth of the discharge pipe.

The edge of the rear face of the regulating wheel, between the wash-out thread of the faces of the carrying profile, is formed as a precisely flat surface which is perpendicular to the axis of rotation of the regulating

[*Price 3s. 6d.*]

wheel, against which the measured tapered roller bears until it is pushed into the mouth of the discharge pipe by the next tapered roller, which is being displaced along the supporting rail in the helical groove of the regulating wheel. In the measuring position the tapered roller is affected by the resilient pressure of the holding-down rail, which tends to push the tapered roller both into the prismatic measuring work rest and towards the rear face of the regulating wheel. During the short time when the larger face of the tapered roller is in contact with the above mentioned flat surface on the rear face of the regulating wheel, the current circuit is completed to the electro-contact head, whose measuring contact rests upon the measured tapered roller. The measuring signals are evaluated by an electronic apparatus known *per se* and transformed into automatic impulses for an increase, if necessary, of the grinding wheel in-feed.

As has already been mentioned, the electro-contact head is electrically connected for a short time only. This occurs when the tapered roller has been displaced from the groove of the regulating wheel, stopped in its axial movement towards the discharge pipe and firmly set upon the prismatic work rest, it being forced down by the resilient pressure of the retaining rail. If the electro-contact head were continuously connected in the current circuit its signal would have a variable course according to the magnitude of the measuring contact lift, the magnitude being a resultant of the axial displacement of the tapered rollers along the prismatic work-rest.

The closing of the current circuit for the electro-contact head is accomplished by a cam coupled to the shaft of the regulating wheel so as to rotate in timed relationship therewith in such a way as to effect the closing of the contacts as soon as the wash out thread of the transport face of the helical guide groove engaging the larger face of the tapered rollers has passed the level of the work-rest. The time for which the current circuit is to be closed may be limited, as needed, by adjusting the cam. The cam may be disposed also on an auxiliary shaft.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a side elevation, partly in section of part of a centreless grinder according to the invention,

Figure 2 is a partial end elevation of the grinder shown in Figure 1,

Figure 3 is a detail view partly in section taken at the grinding throat,

Figure 4 is a diagrammatic view of a switch and operating member therefor.

During the grinding process a tapered roller 1 is located in a helical groove 3 in the regulating wheel 2. The roller 1 is urged by the pressure of a transport face 4 of the groove 3 on a supporting rail 5 in the direction from the forward to the rear face 4*a* of the regulating wheel 2, to the mouth of a discharge pipe 6 for finished tapered rollers. As soon as the wash-out thread of the transport face 4 on the rear face 4*a* of the regulating wheel 2 has passed below the level of the supporting rail 5, the tapered roller 1 lies on a prismatic measuring work-rest 7 under a measuring contact 8 of an electro-contact head 9, being resiliently urged by a rail 10 towards the measuring work-rest 7 and a flat surface 11 between the wash-out thread of both faces of the carrying profile on the rear face 4*a* of the regulating wheel 2. At this moment a cam 12 fixed to the shaft of the regulating wheel 2 or to an auxiliary shaft 15, and rotating in synchronism with the regulating wheel 2 closes a switch 13 on the machine body, whereby a current is fed to the electro-contact head 9, while the duration of the current may be limited by adjusting the peripheral extent of the cam lobe 12, to the time during which the tapered roller 1 rests with its larger face on the flat surface 11 of the rear face 4*a* of the regulating wheel 2. Signals from the electro-contact head 9 are transformed by an electronic device 14 in known manner into an automatic impulse for an incremental in-feed of the grinding wheel.

It is to be understood that the invention is not restricted to the precise constructional details set forth.

WHAT WE CLAIM IS:—

1. A centreless grinding machine having automatic feed adjustment of the grinding wheel during throughfeed grinding of conical surfaces of tapered rollers for antifriction roller bearings, comprising a prismatic measuring work-rest for the measured tapered rollers, an electro-contact head and an electronic feed control of the grinding wheel to the cut, the prismatic measuring work-rest being fixed at the level of a supporting rail close between the rear face of a regulating wheel and the mouth of a discharge pipe for tapered rollers under a measuring contact of the electro-contact head, the shaft of the regulating wheel being coupled to an adjustable cam acting on a switch controlling the current feed for the electro-contact head.

2. A machine as claimed in claim 1, wherein the adjustable cam is fixed to the shaft of the regulating wheel.

3. A machine as claimed in claim 1, wherein the adjustable cam is fixed to an auxiliary shaft.

4. A centreless grinding machine substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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1 SHEET

Fig.1.

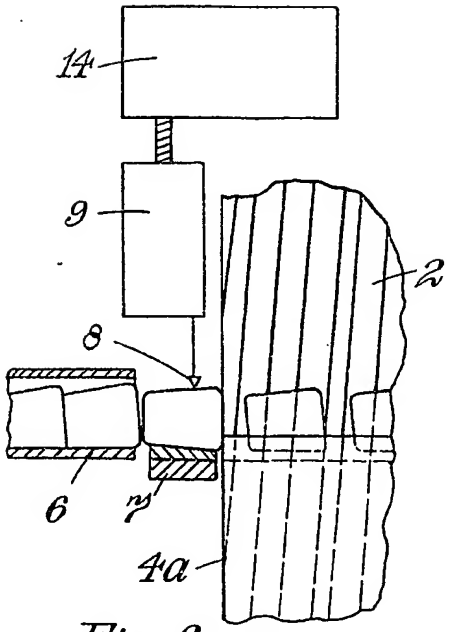

Fig.2.

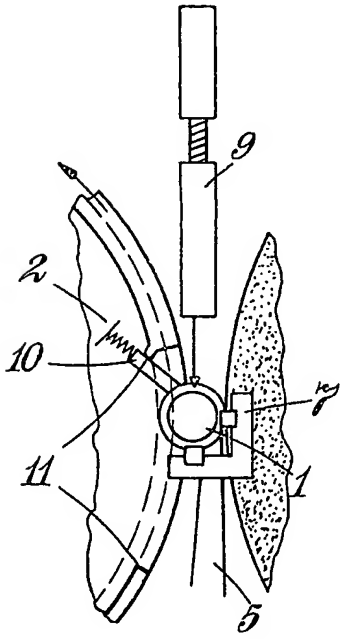

Fig.3.

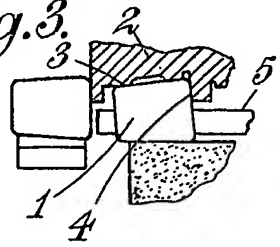

Fig.4.